

**IN THE UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF MASSACHUSETTS**

SINGULAR COMPUTING LLC,

Plaintiff,

v.

GOOGLE LLC,

Defendant.

C.A. No. 1:19-cv-12551-FDS

Hon. F. Dennis Saylor IV

**DEFENDANT GOOGLE LLC'S REPLY IN SUPPORT OF ITS  
MOTION TO STRIKE EXPERT REPORT OF SUNIL KHATRI, PH.D.**

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## I. INTRODUCTION

Singular argues that it “needs” to present the challenged testimony. But Dr. Khatri’s challenged opinions are based on an infringement theory that Singular never disclosed, even though it knew all facts necessary to formulate its new theory by no later than July 2021, when its counsel asked Google witnesses about rounding circuits in the VPU.

Singular claims that it disclosed its current infringement theory in its amended complaint and in its preliminary infringement contentions, but neither of those documents identifies anything *in the VPU* that supposedly is part of an LPHDR execution unit. The preliminary contentions instead claim that the VPU *controls* the LPHDR execution units—a point that Singular fails to address in its opposition. Dr. Khatri’s theory that rounding circuits in the VPU are *part of* the LPHDR execution units contradicts Singular’s contentions, which assert that the VPU controls the execution units.

Singular says that it relied on Google’s publicly available documents when it filed its amended complaint and served its preliminary infringement contentions, seemingly to justify its failure to mention circuitry in the VPU. But once it *did* have access to Google’s internal documents, it didn’t move for leave to amend its contentions to disclose a new position that the LPHDR execution units include circuitry in the VPU. Local Rule 16.6(d)(5) explains how a patentee can seek leave to amend infringement contentions based on newly discovered evidence—and requires that it act diligently in seeking such leave. Instead, when it finally did move to supplement its

contentions, Singular assured Google and the Court that its “see also” cites to hundreds of pages of source code<sup>1</sup> didn’t change its infringement theory.

Because it never sought leave to change its infringement position, and because it’s far too late for it to do so now, Singular is bound by its infringement contentions. Dr. Khatri cannot sponsor a new infringement theory that Singular never itself disclosed. Google’s motion should be granted.

## II. ARGUMENT

### A. The new VPU+MXU LPHDR execution unit theory in Dr. Khatri’s expert report is inconsistent with Singular’s infringement contentions, which assert that the VPU *controls* the LPHDR execution units.

Singular’s opposition ignores that its supplemental infringement contentions continue to assert that the VPU *controls* the LPHDR execution units, Mot. at 7-8, a theory that contradicts Dr. Khatri’s opinion that the rounding circuits in the VPU are *part of* the LPHDR execution units. According to Singular’s contentions, the limitation of claim 7 of the ’156 patent requiring a control device adapted to control the LPHDR execution units is met by “[t]he *Vector Processing Unit (VPU)*” because “[t]he *VPU streams data to and from the MXU . . .*” Bhansali Decl., Ex. 3 at 10 (Singular’s color coding and emphasis).

If Singular is allowed to present Dr. Khatri’s opinion that the rounding circuits in the VPU are *part of* the LPHDR execution units, its disclosed infringement contentions, in which it asserts that the VPU *controls* the LPHDR execution units, would then be circular. Its failure to address

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<sup>1</sup> Singular’s opposition highlights a citation to 33 pages of source code. *See* Opp. at 4. It cited those 33 pages for the high dynamic range limitation. *See* Bhansali Decl., Ex. 3 at 8. But its supplemental contentions cite over two hundred pages of source code for the LPHDR execution unit limitation. *See id.* at 7. It again cites those over two hundred pages for the error rate requirement. *See id.* at 9. In total, it cited over four hundred pages of source code. *See id.* at 5.

this point in its opposition is dispositive; Dr. Khatri’s opinion cannot be squared with Singular’s infringement contentions.<sup>2</sup>

**B. Singular didn’t accuse the VPU as part of the LPHDR execution units in its amended complaint or in its preliminary infringement contentions.**

In its amended complaint, Singular alleges that “each *MXU* has 16,384 *MXU* Reduced Precision Multiply Cells,” and that “each *MXU* Reduced Precision Multiply Cell *is an LPHDR execution unit.*” Am. Compl. ¶ 95 (Dkt. 37) (emphases added). In so defining the accused LPHDR execution unit, it doesn’t mention the VPU. It instead alleges that the multiplication operation performed by the *MXU* Reduced Precision Multiply Cell occurs in “the *MXU* as a whole.” *Id.* ¶ 91 (emphasis added).

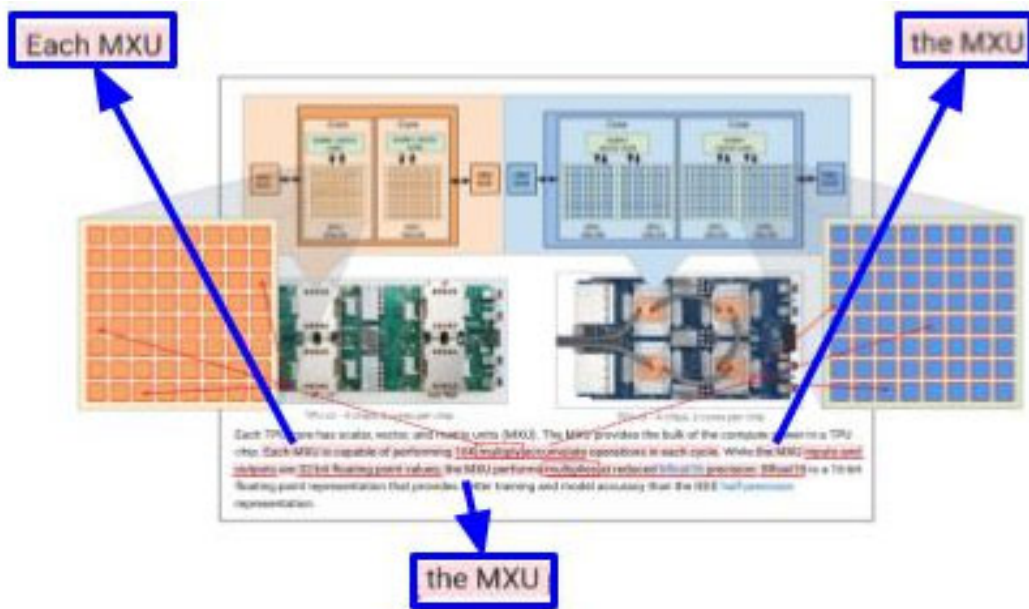
Singular argues that it disclosed that the accused TPUs perform multiplication at “reduced bfloat16 precision.” Opp. at 1. But that accusation falls well short of declaring that *the VPU* is part of the accused LPHDR execution units. It also argues that the amended complaint refers to “circuitry for taking a float32 [FP32] input signal, [and] converting it to a bfloat16 [BF16] value” when it defines the term *MXU* Reduced Precision Multiply Cell. *Id.* at 2 (quoting Am. Compl. ¶ 90.c). But as Singular itself highlights in its opposition, the amended complaint doesn’t allege a conversion that takes place *in the VPU*. *See id.* (quoting, in ***bolded italics***, paragraph 90.c of the amended complaint, which itself quotes a document that states that “[e]ach *MXU* takes inputs in FP32 format but then automatically converts them to bfloat16 before calculation”); *see also* Am. Compl. ¶ 92 (alleging that a signal “representing a float32” (i.e., in FP32 format) moves “rightwards into the left of the *MXU* and its Reduced Precision Multiply Cells.”); *id.* ¶ 90.c

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<sup>2</sup> Singular’s opposition also fails to explain how its statement in its contentions that “the *MXU* multiplier” surpasses the error rate required by the claims could be consistent with Dr. Khatri’s opinion that the accused execution unit includes rounding circuits in the VPU. *See* Mot. at 7.

(alleging that the *MXU* Reduced Precision Multiply Cell is “*part of an MXU ALU*” (emphasis added)). No one could reasonably be expected to read those allegations to include circuitry outside the *MXU* as part of the “*MXU Reduced Precision Multiply Cell*”—rounding circuitry that instead is in the *VPU*. Singular tacitly admits as much by arguing that in March 2020, when it filed the amended complaint, it couldn’t have disclosed the rounding circuits in the *VPU* because it hadn’t yet seen Google’s internal confidential information. Opp. at 2.

Singular’s opposition likewise doesn’t point to anything in its preliminary infringement contentions that identifies anything *in the VPU* that’s part of the accused LPHDR execution units. *See id.* at 2-3. Singular was required to disclose, with as much specificity as reasonably possible, “*where* and how each element of each asserted claim is found in each accused product or method.” L.R. 16.6(d)(1)(A)(iii) (emphasis added). Its preliminary contentions point only to the *MXU* as the “*where*” for the accused LPHDR execution units:



*See* Bhansali Decl., Ex. 5 at 6 (blue boxes and arrows added here); *see also id.*, Ex. 6 at 6.

Singular now asserts that those contentions disclosed its two-stage rounding/multiplication theory, Opp. at 3, but doesn’t claim that it identified anything *in the VPU* that was part of those



two stages, or indeed anything outside of the MXU at all. Singular notes that it again was relying on public documents, *id.*, but doesn't dispute that its preliminary contentions don't identify *the VPU* as part of the LPHDR execution units.

**C. Singular never sought leave to replace its MXU-only LPHDR execution unit theory with a new VPU+MXU LPHDR execution unit theory.**

Singular's supplemental infringement contentions didn't provide notice that it was switching to a new theory in which rounding circuits in the VPU were part of the accused LPHDR execution units. Instead, the supplemental contentions repeated all of its preliminary contentions, which mapped the LPHDR execution unit onto only the MXU, *see* Mot. at 6-9, and when it moved for leave to add the source code citations, it represented to the Court that Google wouldn't be prejudiced because "Singular's infringement theories have not changed." Dkt. 355-1 at 5.

Singular argues that the source code citations in its supplemental contentions—which cite page ranges corresponding to entire source code files—disclosed that it was relying on a rounding operation in the VPU. *See* Opp. at 4. But having told Google that it needn't worry about a new infringement theory, it cannot now claim that it disclosed its new theory in one part of one file buried in its blanket "see also"<sup>3</sup> citations to source code.

As Google explained at the time, the source code citations in the supplemental infringement contentions were too vague, "with no explanation of where within those page ranges the accused limitation is present." Dkt. 363 at 4. Having refused to disclose more details, Singular is stuck with the limited disclosure provided by its blanket citations. It cannot now credibly argue that it

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<sup>3</sup> All the source code citations in the supplemental contentions are introduced with the "see also" signal. That signal identifies "additional source material that supports the proposition." *The Bluebook: A Uniform System of Citation* § 1.2. Yet here "the proposition" could only be in its preliminary contentions, which don't accuse anything in the VPU as part of the LPHDR execution unit. Singular's use of the "see also" signal at least failed to suggest that it was disclosing a changed infringement theory.

impliedly disclosed a new theory based on rounding circuits in the VPU in its citations to wide swaths of source code, particularly when it continued to assert, in its supplemental contentions, that the VPU controls the LPHDR execution units.

**D. Singular knew about the rounding circuits in the VPU for more than a year before it sought leave to supplement its infringement contentions with source code citations.**

When Singular took the deposition of Google witness Andrew Phelps on July 14, 2021, its questions reflected that counsel knew that the MXU receives inputs in the 16-bit BF16 format, not in the 32-bit FP32 format. *See* Speed Decl., Ex. 1 at 31:18-20 (Phelps Depo.). Counsel also knew that the rounding circuits were in the VPU, not the MXU. *See id.* at 58:22-24. Mr. Phelps confirmed those understandings, as did another Google witness, Norman Jouppi, two days later. *Id.* at 31:22, 58:25-59:2; *id.*, Ex. 2 at 51:18-55:9 (Jouppi Depo.) Yet Singular didn't then seek leave to amend its infringement contentions to disclose a new theory in which rounding circuits in the VPU were accused as part of the LPHDR execution units.

Singular argues that when it moved for leave to supplement its contentions, on August 11, 2022, that was mere weeks after receiving source code printouts. But it didn't need the printouts to disclose that it wanted to rely on rounding circuits in the VPU. If that was its theory, it could have sought leave to amend its contentions shortly after the Phelps and Jouppi depositions—a year before receiving source code printouts. It didn't seek leave to do so then, and when it did seek leave to supplement, Singular told Google and the Court that it wasn't altering its infringement theory.

**E. Singular never sought leave to change its infringement theory, and even if it had sought such leave in August 2022 that would have been too late.**

Local Rule 16.6(d) required Singular to disclose its infringement theories “with as much specificity as reasonably possible from publicly available information or other information then

within the patentee’s possession, custody, or control.” L.R. 16.6(d)(1)(A). To switch course after serving preliminary contentions, a patentee must first seek “leave of court upon a *timely* showing of good cause.” *Id.* 16.6(d)(5) (emphasis added). One such ground is the “discovery of nonpublic information about the asserted infringement that was not discovered or located, despite diligent efforts, before the service of the infringement claim charts.” *Id.* 16.6(d)(5)(C).

The patentee bears the burden of demonstrating that it acted diligently. *Philips N. Am. LLC v. Fitbit LLC*, No. 19-11586-FDS, 2021 WL 5417103, at \*3 (D. Mass. Nov. 19, 2021). Leave to amend infringement contentions is governed by a “decidedly conservative” policy that’s designed to prevent a patentee from changing course late in the game. *See id.* (quotation marks and citations omitted); *cf. Trs. of Bos. Univ. v. Everlight Elecs. Co.*, 392 F. Supp. 3d 120, 130 (D. Mass. 2019) (in the context of a motion for leave to amend a complaint, distinguishing Rule 15(a)’s liberal policy favoring amendment from the more demanding “good cause” required for amendment after a deadline in a scheduling order). A “good cause” standard “focuses on the diligence (or lack thereof) of the moving party more than it does on any prejudice to the party-opponent.” *O’Connell v. Hyatt Hotels of P.R.*, 357 F.3d 152, 153-54 (1st Cir. 2004) (addressing “good cause” required by a scheduling order).

Long before it received source code printouts, Singular knew about the rounding circuits in the VPU, and that the inputs to the multipliers in the MXU are in BF16 format. But it stood pat on its preliminary contentions, which didn’t identify anything in the VPU as part of the accused LPHDR execution units. Because it didn’t move for leave to assert a new VPU+MXU LPHDR execution unit theory, Singular necessarily never made a showing of good cause. And because it represented that its supplemental contentions didn’t change its infringement theory, the Court’s

allowance of that supplementation cannot be understood to have authorized a *sub rosa* assertion of a new infringement theory.

Had Singular told Google and the Court in August 2022 that it was seeking leave to assert a new infringement theory, the fact that it had possessed all the information necessary to disclose that theory *more than a year prior* would have rebutted any argument that it had diligently sought leave to amend its contentions. “Courts have typically rejected a finding of diligence where new products [that the patentee seeks to accuse of infringement] were available for five months or more.” *Philips*, 2021 WL 5417103, at \*3; *see also* Dkt. 345 at 1 (Singular arguing, successfully, that in view of the passing of the deadline in the scheduling order, the Court should deny Google leave to amend its answer based on Google’s delay of “more than 10 months and 4 months, respectively,” from the date of production of two prior art references) (citing *Riofrio Anda v. Ralston Purina, Co.*, 959 F.2d 1149, 1154-55 (1st Cir. 1992) (denying leave due to two month delay)). Here, Singular delayed for more than a year after its counsel’s questions at the Phelps and Jouppi depositions demonstrated that counsel had actual knowledge of the relevant facts—knowledge that Mr. Phelps and Dr. Jouppi confirmed. And when it did move for leave to supplement its contentions, it disavowed that it was seeking to change its infringement theory.

It doesn’t matter that Google knows how its own products function. Infringement contentions disclose the theories that the patentee is asserting, and what Google knew about those theories was that Singular hadn’t accused anything in VPU as part of the LPHDR execution units, and that its disclosed theory misstated how the TPUs work because it assumed the MXUs accept inputs in FP32 format. By not telling Google what its plan, if any, was to fix this problem, Singular might have thought it was keeping its options open—but that strategy was foreclosed by Local Rule 16.6(d)(5). Google wasn’t required to speculate what other undisclosed theories Singular

*could* raise—Singular was required to make its intentions clear by choosing a new theory and timely moving for leave to amend its contentions. Nor can it argue that it *hinted* at its choice by asking questions about the rounding circuitry in the VPU, because it never moved for leave to assert a theory based on circuitry in the VPU. *See Philips*, 2021 WL 5417103, at \*4 (prior discussions between counsel that arguably disclosed new contentions were “without legal effect”); *see also id.* at \*5 (rejecting argument that the patentee’s delay in seeking leave was justified by a desire to move for leave only once).

Because Singular never sought leave to change its infringement theory, it doesn’t matter whether it could have demonstrated good cause had it so moved. But even had it sought such leave in its August 2022 motion, it would have been unable to show that it acted diligently, given its lengthy delay. Were it to move for leave now, its delay would be even more inexcusable. *See id.* (noting that lack of diligence was “likely dispositive”).

**F. Non-patent cases about untimely expert disclosures aren’t relevant.**

Google’s motion is based on Singular’s failure to disclose the VPU+MXU LPHDR execution unit theory in its infringement contentions, as required by Local Rule 16.6(d). Local Rule 16.6 governs actions “involving disputes over the infringement, validity, or enforceability of a United States patent.” L.R. 16.6(a). Yet Singular’s opposition doesn’t cite any patent cases. Citing non-patent cases, it argues that the Court can admit belatedly proffered expert evidence if the lack of timely disclosure was substantially justified or harmless. Opp. at 7 (citing *Poullis-Minott v. Smith*, 388 F.3d 354, 358 (1st Cir. 2004) (maritime), and *Lohnes v. Level 3 Commc’ns, Inc.*, 272 F.3d 49, 60 (1st Cir. 2001) (securities)). Because neither of those cases was a patent case, they

didn't address Local Rule 16.6(d)(5)'s conservative policy regarding amending contentions to add new patent infringement theories.<sup>4</sup>

Google's motion in any event isn't based on an untimely disclosure by Dr. Khatri; his expert report was served on time. Singular's problem is *its own* lack of disclosure in the infringement contentions required by Local Rule 16.6(d). Whether Dr. Khatri fervently believes in the two-stage VPU+MXU theory is beside the point, because *Singular* never disclosed that theory, and to this day hasn't sought leave to do so, even though it had actual knowledge of the rounding circuits in the VPU by no later than July 2021, when its counsel questioned Mr. Phelps and Dr. Jouppe about them.

**G. Singular's sandbagging isn't harmless, and shouldn't be overlooked just because its disclosed infringement theory is factually incorrect.**

A "party may not use an expert report to introduce new infringement theories . . . not disclosed in the parties' infringement contentions . . . ." *ASUS Comput. Int'l v. Round Rock Research, LLC*, No. 12-cv-02099-JST (NC), 2014 WL 1463609, at \*1 (N.D. Cal. Apr. 11, 2014). Singular argues that its failure to seek leave to change its infringement theory is "harmless," and that Google has plenty of time to "overcome" any harm. *See* Opp. at 7-8, 10. But, for reasons that the Federal Circuit has explained, Singular's failure to move for leave to amend its infringement contentions at any time since July 2021 is, on its own, grounds for granting Google's motion to strike. *O2 Micro Int'l Ltd. v. Monolithic Power Sys., Inc.*, 467 F.3d 1355, 1367-68 (Fed. Cir. 2006)

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<sup>4</sup> Other cases Singular relies on likewise don't address Local Rule 16.6(d)(5)'s conservative approach to the amendment of patent infringement contentions. *See, e.g., Glass Dimensions, Inc. v. State Street Bank & Trust Co.*, 290 F.R.D. 11 (D. Mass. 2013) (ERISA); *Moura v. New Prime, Inc.*, No. 4:17-cv-40166-TSH, 2020 WL 8570854 (D. Mass. Dec. 11, 2020) (wrongful death); *D'Pergo Custom Guitars, Inc. v. Sweetwater Sound, Inc.*, 340 F.R.D. 535 (D.N.H. 2020) (copyright); *Jackson v. Harvard Univ.*, 900 F.2d 464 (1st Cir. 1990) (Title VII); *Brodbeck v. Mass. Dep't of Corr.*, No. 18-cv-10855-DJC, 2021 WL 3131601 (D. Mass. July 23, 2021) (Title VII).

(“Given O2 Micro’s delay in moving to amend its infringement contentions and its lack of adequate explanation for this delay, . . . we see no need to consider the question of prejudice to MPS.”); *see also KlausTech, Inc. v. Google LLC*, No. 10-cv-05899-JSW (DMR), 2018 WL 5109383, at \*8 (N.D. Cal. Sept. 14, 2018) (“Google need not establish prejudice”).<sup>5</sup> Regardless, Google proceeded with fact discovery under the assumption that Singular meant what it said in its contentions. Asserting a new infringement theory after the close of fact discovery is inherently prejudicial. *Finjan, Inc. v. Symantec Corp.*, No. 14-cv-02998-HSG (JSC), 2018 WL 620169, at \*2 (N.D. Cal. Jan. 30, 2018).

Singular argues that its failure to follow Local Rule 16.6(d)’s requirement that it seek court leave prior to changing infringement theories should be excused because it needs Dr. Khatri to testify about its never-disclosed infringement theory. Opp. at 11. The reason for that need, however, is that the infringement theory that it disclosed in its contentions rests on an incorrect characterization of how Google’s TPUs function, and thus cannot be proven. But Singular knew how the TPUs *actually* function by no later than July 2021. It didn’t *need* to wait until expert discovery to reveal its new infringement theory, and Local Rule 16.6(d)(5)’s requirement that a patentee act diligently if it seeks to change its theory of the case is designed to avoid any such late-stage ambush.

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<sup>5</sup> In opposing Google’s motion for leave to amend its answer Singular notably argued that undue delay alone warranted denying Google’s motion. Dkt. 345 at 4-5 (citing *Steir v. Girl Scouts of the USA*, 383 F.3d 7, 12 (1st Cir. 2004); *Carreiro v. Toter, LLC*, No. 1:20-cv-11119-IT, 2021 WL 3726939, at \*2 (D. Mass. Aug. 23, 2021); *Hagerty ex rel. U.S. v. Cyberonics, Inc.*, 844 F.3d 26, 34 (1st Cir. 2016); *Kay v. N.H. Democratic Party*, 821 F.2d 31, 34-35 (1st Cir. 1987); *Riofrio Anda*, 959 F.2d at 1154-55; *Kader v. Sarepta Therapeutics, Inc.*, 887 F.3d 48, 61 (1st Cir. 2018); and *Villanueva v. U.S.*, 662 F.3d 124, 127 (1st Cir. 2011)).

### III. CONCLUSION

For the foregoing reasons, the Court should grant Google's motion and strike the portions of Dr. Khatri's expert report that rely on a two-stage "LPHDR multiplication operation," including but not limited to paragraphs 128-133, 140-142, 144-146, 148, 158-174, 178-210, 212, 222-223, 228-233, 235, and 237-238, and also the exhibits to his report that are cited only in stricken portions of the report, including but not limited to Exhibits D-G.

Respectfully submitted,

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